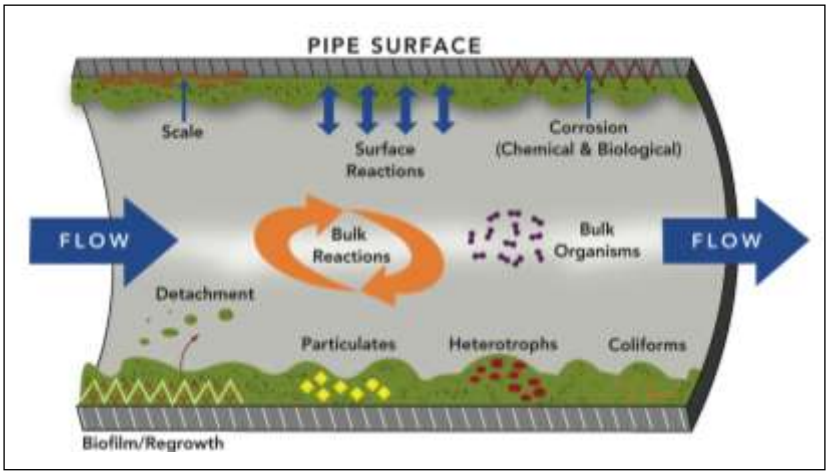
TECHNICAL BRIEF

Tools for Managing Water Quality

Presidential directives and other key documents directly charge EPA with ensuring the security and quality of U.S. water resources. EPA has recently published a manual offering tools and advice that will enable water utilities to more effectively monitor the quality of the water in their distribution systems.

Background

The Water Infrastructure Protection Division (WIPD) of EPA's National Homeland Security Research Center is responsible for protecting the nation's water resources and infrastructure. It conducts and coordinates research to improve the security of drinking water and wastewater treatment systems, and mitigate the effects to those systems from intentional attacks.



Distribution System Interactions That Affect Water Quality
(adapted from an image provided by Montana State University's Center for Biofilm Engineering, 2005)

EPA's National Risk Management Research Laboratory (NRMRL) investigates technological and management approaches to prevent and reduce pollution-related risks to human health and the environment. NRMRL collaborates with public and private sector partners to foster technologies that reduce the cost of regulatory compliance and to anticipate emerging problems.

WIPD and NRMRL's Water Supply and Water Resources Division recently collaborated to produce a guide for water utilities. *Distribution System Analysis: Field Studies, Modeling, and Management* informs drinking water utilities and researchers about the state of the art in managing water quality. This guide includes discussions not only of models and model calibration, but also of the use of tracers and monitors, as well as the growing availability of geospatial data. Case studies are included.

Tools for Water Quality Management

The nation's water utilities treat nearly 34 billion gallons of water every day, using an assortment of treatment methods to remove contaminants from drinking water before it enters the distribution system. The quality of water can still be affected within the distribution system, however, in ways that pose risks to public health. A number of tools are available to help utilities manage water quality; *Distribution System Analysis* describes these tools—and how to apply them—in useful detail.

Modeling Water Systems Models are mathematical or physical approximations of a real-world system. Utilities can use them for simulating not just a distribution system's hydraulics, but also its likely effects on water quality. Models are often employed for decisions involving capital investment, for developing a master plan, or for optimal placement of sensors. They need to be carefully calibrated, however, to make sure they simulate the particular distribution system as closely as possible.

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Tracer Studies Water can move in very complex ways within a distribution network. The speed of movement, and how mixing occurs in tanks and reservoirs, can vary greatly. To track this movement, utilities can use tracers, such as a chemical, whose concentration can be monitored at various points in the system. Ideally, tracers are used with a water quality-monitoring program that includes sampling at a number of locations.

Monitoring Water Quality Water quality in a distribution system may vary for a great many reasons, so utilities continually monitor it at multiple locations to ensure that it remains acceptable. Water samples can be collected either manually or automatically. Manual sampling will provide a series of "snapshots," whereas automated sampling makes a composite of multiple samples over time to provide a continuous profile. An automated monitoring system is designed for a particular distribution network, and can be chosen to monitor appropriate physical, chemical, and/or biological characteristics. The resulting information is used to control treatment processes as well as to warn of contaminants.

Geospatial Technology Since water distribution systems may cover quite a large area, it is very useful to have geospatial data to pinpoint the precise physical location of a particular feature of the network. Geographic information systems (GISs) can help utilities in their routine operations as well as in coping with emergencies.

Water Utility Guide Availability

Distribution System Analysis: Field Studies, Modeling, and Management is available on the NHSRC Web site at http://www.epa.gov/ORD/NRMRL/pubs/600r06028/600r06028.htm. Another document that may be of interest to water utilities can be found at:

> http://www.epa.gov/nhsrc/pubs/reportEWS120105.pdf: Technologies and Techniques for Early Warning Systems to Monitor and Evaluate Drinking Water Quality: A State-of-the-Art Review

For more information, visit the NHSRC Web site at www.epa.gov/nhsrc and the NRMRL Web site at www.epa.gov/ord/nrmrl.

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